

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1-31. (cancelled)

32. (previously presented): An oxygen sensor for determining the oxygen concentration of a gas, comprising first and second chambers (62, 64) formed between first and second oxygen ion conductive cell substrates (66, 68) and first and second electrodes (68a, 68b) formed on the same plane of the second cell substrate (68), said first electrode (68a) being formed on an inside wall of the second chamber (64) and said second electrode (68b) being formed outside of the second chamber (64),

wherein the area of the first electrode is at least twofold larger than that of the second electrode, and

the sensor comprises means for applying an electric potential in the range of 0.2 V to 1.1 V between the first and second electrodes such that a pump current flows between the first and second electrodes when the sensor is used to determine the concentration of oxygen in a gas, said pump current being a measurement of oxygen concentration.

33. (previously presented): A humidity sensor for determining the humidity of a gas, comprising first and second chambers (62, 64) formed between first and second oxygen ion conductive cell substrates (66, 68) and first and second electrodes (68a, 68b) formed on the same

plane of the second cell substrate (68), said first electrode (68a) being formed on an inside wall of the second chamber (64) and said second electrode (68b) being formed outside of the second chamber (64),

wherein the area of the first electrode is at least twofold larger than that of the second electrode, and

the sensor comprises means for applying an electric potential in the range of 1.1 V to 2.5 V between the first and second electrodes such that a pump current flows between the first and second electrodes when the sensor is used to determine the humidity of a gas, said pump current being a measurement of humidity.

34. (previously presented): An oxygen sensor for determining the oxygen concentration as a component of a gas containing NO_x, comprising first and second chambers (62, 64) formed between first and second oxygen ion cell substrates (66, 68) and first and second electrodes (68a, 68b) formed on the same plane of the second cell substrate (68), said first electrode (68a) being formed on an inside wall of the second chamber (64) and said second electrode (68b) being outside of the second chamber (64),

wherein the area of the first electrode is at least twofold larger than that of the second electrode, and

the sensor comprises means for applying an electric potential in the range of 0.2 V to less than 0.5 V such that a pump current flows between the first and second electrodes when the sensor is used to determine oxygen concentration as a component of a gas containing NO_x, said pump current being a measurement of oxygen concentration.

35. (previously presented): The oxygen sensor as claimed in claim 34, wherein a pump current of less than 10 microamperes flows between the first and second electrodes when an electric potential in the range of 0.2 V to less than 0.5 V is applied across the first and second electrodes.

36. (previously presented): A sensor for detecting the amount of a gas, comprising:

a first oxygen ion pump cell (66), an oxygen-concentration-measuring cell (67), and a second oxygen ion pump cell (68), which are sequentially arranged over each other;

the first oxygen ion pump cell (66) including a first solid electrolyte layer and electrodes (66a) and (66b) provided on opposite sides of the first solid electrolyte layer;

the oxygen-concentration-measuring cell (67) including a second solid electrolyte layer and oxygen partial-pressure detection electrodes (67a) and (67b) provided on opposite sides of the second solid electrolyte layer;

the second oxygen ion pump cell (68) including a third oxygen ion conductive solid electrolyte layer and oxygen pump electrodes (68a) and (68b) provided on the same side of the third oxygen ion conductive solid electrolyte layer;

a first measurement chamber (62) defined by the first oxygen ion pump cell (66);

a second measurement chamber (64) defined by the second oxygen ion pump cell (68);

first and second diffusion holes (61) and (63) located apart from one another and serving as serial passageways for transmission of measurement gas from outside of the sensor toward the electrode (68a) via diffusion resistance,

said second diffusion hole (63) extending through the oxygen-concentration-measuring cell (67) and the second solid electrolyte layer to establish communication between the first and second measurement chambers (62) and (64); and

said oxygen ion pump electrodes (68a) and (68b) differing in area by at least twofold.

37. (previously presented): A sensor element (20) comprising a first solid electrolyte substrate (22), a second solid electrolyte substrate (24) and a negative electrode (34a) and positive electrode (32a) sandwiched between said first and second solid electrolyte substrates, said negative and positive electrodes being disposed on the same side of said first solid electrolyte substrate (22), the sensor element further comprising a gas diffusion portion (34c) for introducing a gas to be measured into the negative electrode (34a) and a gas outlet hole (26) formed through the second solid electrolyte substrate (24) so as to expose a portion of the positive electrode (32a) allowing oxygen to be released from the positive electrode (32a) to an exterior of the sensor element (20), wherein

the area of said negative electrode (34a) and the area of said positive electrode (32a) differ by at least two fold.